Adapting an argumentation framework for online discourse analysis: A knowledge building approach

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The use of online tools to support teaching and learning is now commonplace within educational institutions, with many of these institutions mandating or strongly encouraging the use of a blended learning approach to teaching and learning. Consequently, these institutions generally adopt a learning management system (LMS), with a fixed set of collaborative tools, in the belief that effective teaching and learning approaches will be used, to allow students to build knowledge. While some studies into the use of an LMS's still identify continued didactic approaches to teaching and learning, the focus of this paper is on the ability of collaborative tools such as discussion forums, to build knowledge. In the context of science education, argumentation is touted as playing an important role in this process of knowledge building. However, there is limited research into argumentation in other domains using online discussion and a blended learning approach. This paper describes a study, using design research, which adapts a framework for argumentation that can be applied to other domains. In particular it will focus on an adapted social argumentation schema to identify argument in a discussion forum of N=16 participants in a secondary High School.

Keywords: Argumentation, knowledge building, asynchronous communication, discourse analysis

Introduction

There is an increased expectation for all educators to use ICT, and more specifically, the Internet, to support students' development of knowledge building in all curriculum areas (sometimes also referred to as e-learning). ICT has been said to have "the potential to extend student learning capabilities, engaging them in understanding concepts and processes in areas of learning and facilitating change in learning, thinking and teaching" (Curriculum Corporation, 2006, p. 2). However, the mere introduction of the computer and, more recently, the plethora of online applications that exist and have been touted as essential for the attainment of educational goals, does not automatically ensure that learning will occur. Consequently, this emergent use of online tools in education has resulted in new pedagogical approaches to teaching and learning, sometimes with mixed results.

Initially, the idea of using e-learning systems, such as an LMS), was focused around the ability to connect with external and distance education students and provide greater access and flexibility to these students (Allen & Seamen, 2007; Mason, 2004). However, e-learning has now become a core component of the education experience for many students in education and an ever-increasing combination of face-to-face (F2F) learning and e-learning is now occurring (Borden, 2011). This learning, referred to as blended learning, uses technology to expand the physical boundaries of the classroom, providing access to learning content and resources and enhancing the instructor's ability to receive feedback on learners' progress (Klein, Noe & Wang, 2006).

In creating this blended learning environment in education, an LMS (such as Blackboard© or Moodle) is often used to access inbuilt collaboration tools such as blogs, wiki's and discussion forums. These tools, often referred to as web 2.0 or e-learning 2.0 tools, are most common to these environments and touted as having the ability to empower educators to facilitate a sense of community through the possible interactions that could occur in these environments. Consequently, it is this buoyant relationship between the use of Internet collaboration tools and people that has the potential to create powerful online learning communities (Hartnett, Battacharya, & Dron, 2007). However, there is an expectation that students will be engaged and that knowledge building will also occur in these environments.

While there is continuing research in this area, the frameworks previously used for analysing data do not lend themselves readily to the typical blended learning environment that is so typical of secondary schools. This paper discuses a study that adapts a social argumentation schema that can be applied to online discourse in domains other than science education. It is based on a study of N=16 senior secondary school students studying families. Each of the participants (N=16) are female and were known to each other through every day classes. The study was limited to the use of a discussion forum that can only be accessed during school hours. The

study described here, specifically investigated the discourse of 6 discrete forums where argument was encouraged. It then used a social argumentation schema, based on the work of Duschl et al. (1999), and an adapted social argumentation schema to code the discourse in the online discussion forums.

Argumentation in Learning

The study of argumentation in education is not new and there is an extensive literature base pertaining to it, particularly in science education (Jiménez-Aleixandre & Erduran, (2008); Duschl & Ellenbogen, 2001; Duschl & Osborne, 2002; Osborne et al., 2001). Supporting this notion further, Richmond and Striley (1996) claimed that learning not only involves the internal development of student conceptions but also the external process of discussion and argument. They suggested that the interaction between students with one another and with the teacher plays a vital role in the process of students' learning. Within this context, Johnson and Johnson (2004) also noted the value of structuring learning activities in the form of argument and suggested that this results in students sharing ideas with one another and working together to find a common solution. Consequently, this discourse allows students to engage in learning through a community of practice, such as that which can potentially be formed through the use of collaborative tools in a blended learning environment.

Argumentation can be viewed as either a product or process. As a product, arguments are viewed as objects to be constructed or critiqued. As a process, argument focuses on the social interaction which occurs when two or more people are having an argument (O'Keefe, 1982). Argument is evident in either an individual sense (rhetorical) or a social sense (dialogical) (Kuhn, 1993b). In an individual sense, argument refers to a person conversing, speaking or writing about a topic in a reasoned way whereas argument in a social sense refers to the "dialogue between two or more people who hold opposing views" (Kuhn, 1993b, p. 323). Argumentation can further be seen as a language genre (Duschl & Osborne, 2002) and, as such, holds much credence in education theory. Education, particularly in the sciences and applied sciences, can be seen as a social activity where theories are challenged and refuted (Kuhn, 1993a; Newton et al., 1999; Osborne et al., 2001). An individual's understanding of scientific phenomena advances through the thought processes and discussions that occur between individuals.

Argument, in everyday terms, involves individuals proposing an explanation for an event, providing evidence to substantiate their explanation and then evaluating the feedback being given by the other individual/s involved in the argument. After comparing the feedback or evidence presented to them in the argument, the individual then modifies or abandons their original explanation. It is through this interaction with the outside world and other people that students develop their understanding and knowledge of the world (Newton et al., 1999; Osborne et al., 2001).

Current research pertaining to the discourse which occurs in the classroom has relied on the analytical form of argument (Duschl et al., 1999; Kuhn, 1993b) or "Toulmin's model for practical arguments" (Duschl et al., 1999, p. 4). Duschl et al., (1999) claimed that the emphasis of these studies is on the structural features of argument and proposed that an alternative to this is the use of "dialog logic to the analysis argumentation discourse" (p. 4). As noted, there are a number of extant argumentation schemes and it has been suggested that:

> Argumentation schemes are forms of argument that capture stereotypical patterns of human reasoning, especially defeasible ones like argument from expert opinion, that have proved troublesome to view deductively or inductively. … It is argued that defeasible argumentation schemes require both a systematic and a pragmatic justification, of a kind that can only be provided by the case study method of collecting key examples of arguments of the types traditionally classified as fallacies, and subjecting them to comparative examination and analysis. By this method, postulated structures for schemes can be formulated as hypotheses to solve three kinds of problems: (1) how to classify such arguments into different types, (2) how to identify their premises and conclusions, and (3) how to formulate the critical questions used to evaluate each type of argument.
> (Walton, 2005, p. 1)

An adapted argumentation framework

During the analysis stage of the study, the focus of this paper, the first coding of messages in the forum transcripts followed Duschl et al.'s (1999) social argumentation schema which was developed from the seminal work of Walton (1996). The categories of this schema used as the first framework of analysis in this study ,

summarised in Table 1, are: (a) sign, (b) commitment, (c) position to know, (d) expert opinion, (e) evidence to hypothesis, (f) correlation to cause, (g) cause to effect, (h) consequences, and (i) analogy.

Table 1

Summary of social argumentation schema (Duschl et al., 1999)

Argument Form	Definition
Sign	Reference to spoken or written claims are used to infer the existence of a property or occurrence of an event.
Commitment	A claims that B is, or should be, committed to a particular position on an issue.
Position to know	A has reason to presume B has knowledge of or access to information that A does not have, thus when B gives an opinion, A treats it as true/false
Expert opinion	Reference to an expert source external to the given information
Evidence to hypothesis	Reference to premises followed by a conclusion
Correlation to cause	Infers a casual connection between two events from a premise describing a positive correlation between them.
Cause to effect	Reference to premises that are casually linked to a non-controversial effect.
Consequences	Practical reasoning in which a policy or course of action is supported/rejected because the consequences will be good/bad.
Analogy	Used to argue from one case that is said to be similar to another.

However, the need for a second coding soon emerged from the data when the analysis process began. It quickly became apparent that the selected schema (Duschl et al., 1996), while, indicating formal measures of argumentation, was not effective in identifying the more informal, personal, and sometimes idiosyncratic "arguments" being expressed by the subjects in this study. This is a key issue that becomes more apparent as we move away from studies of adults and focus on High school students.

The subjects, all adolescent girls known to each other, were communicating in a natural, almost conversational, way and the formal schema, arguably designed for more adult and stylised interactions, was not entirely effective in its analysis. It was also apparent that identifying evidence of knowledge building would be difficult through the selected schema. A second more customised framework was therefore required. It was drawn from:

1. the nature of the topic under review and the teaching approach adopted;
2. the aim of knowledge building; and,
3. instances in the data itself.

The topic under review, as noted, was 'families' and students were encouraged, sometimes provoked (academic controversy), to challenge their own personally-held views or to draw – and reflect (after Harasim, 1993) - upon their own experience. Knowledge building is effectively a constructivist process of building from what is known to broader more informed understandings. Put simply, a coding schema was needed which took the importance of lived experience from the students' perspective into account. This coding schema has seven elements which are summarised in Table 2.

Table 2

Summary of customised schema

Code	Descriptor	Brief explanation
O	Opinion or statement	A generally short response which offers little explanation or reasoning.
SPE	Statement supported with personal experience	Response is supported by personal experience indicating a personal association with the original discussion stimulus.
Ev	Evidence not including personal experience	Response is supported by an external source of reference or external evidence.
R	Recommendation	Response draws upon other responses and recommends a course of action.
Q	Question	A question is asked in relation to the forum topic.

Code	Descriptor	Brief explanation
N/R	Not Relevant	An "off-task" response unconnected to, or disconnected from, the topic under discussion.
SM	Subliminal message	Response has tangential links to the forum topic and may open further discussion.

The elements of the customised schema developed for this study emerged from the collected data with substantiation from content analysis (Garrison et al., 2001; Henri, 1992; Jeong, 2003). The content analysis used in these previous studies was used as a classification framework to explore such factors as problem solving, critical thinking or cognitive presence. In this study the schema developed is used to explore knowledge building through argumentation. The customised schema identifies seven elements which can be similarly reduced and linked to the regrouped categories of the argumentation schema developed by Duschl et al., (1996). These were request for information, expert opinion, inference and analogy.

In the customised schema, the element of opinion (O) could be associated with the category request for information, while the elements statement supported with personal experience (SPE) and evidence not including personal experience (Ev) could be associated with the category of expert opinion. The element of recommendation (R) in the customised schema is similarly associated with the Duschl et al. (1996) category of inference.

The first four elements of the customised schema, that is, Opinion or statement [O], Statement supported with personal experience [SPE], Evidence not including personal experience [Ev] and Recommendation [R], could be classed as cognitive elements as they represent a simple continuum of cognitive processes similar to the shift from declarative to procedural knowledge (after Anderson, 1976) and from elementary clarification to the application of strategies in Henri's (1992) cognitive skills hierarchy.

This continuum is shown diagrammatically in Figure 1 with the arrow indicating the shift from a simple autonomic, usually autobiographical or egocentric, response through to one which shows that knowledge has been internalised to the point it forms the basis of informed opinion (through making a considered recommendation for action to others). This conceptual shift is used as the measurement of knowledge building.

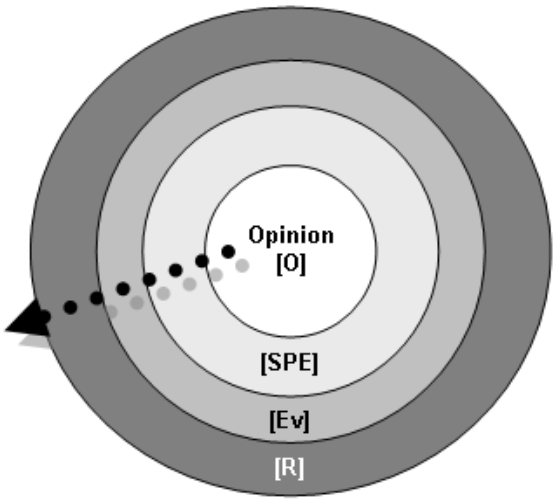

Figure 1 Procedural change in schema elements

These first four elements, however, critically, retain a loose connection with elements of the selected social argumentation schema (Duschl et al., 1996). That is:

1. *Opinion or statement* [O] is similar to the element of *Sign* in its simplicity and inferential connection to the topic being discussed.
2. *Statement supported with personal experience* [SPE] is complementary with the element of *Evidence to hypothesis* and more broadly to the grouped category of *Inference.*

3. *Evidence not including personal experience* [Ev] is complementary with the element of *Expert Opinion* in that an external source is used to support the argument being presented.
4. *Recommendation* [R] is complementary with the element of *Consequences* because of the "practical reasoning" employed.

The remaining three elements, that is, (1) Question [Q], (2) Not Relevant [N/R], and (3) Subliminal message [SM], can similarly be grouped together as argument forms. They describe the form, rather than the implicit cognitive process, of the message.

A **question [Q]** is interesting in that this form features strongly in discourse analysis and in some frameworks (see, for example, Garrison et al., 2001). For adolescents to ask a question of others is an indication of disequilibration, the necessary precursory step to knowledge building. Put more simply, this is a "knowing what they do not know." Questioning fits, complementarily, with the broad grouping of *request for information* in the social argumentation schema (Duschl et al., 1996) also selected as the more formal analysis framework in this study.

An N/R message is akin to that described as either a social cue (Henri, 1992) or acknowledgment (Bonk, Supplee, Angeli & East, 1998). It was described by Henri (1992) as "a statement *not related* to formal content of subject matter" (p. 126, emphasis added) and generally taken to be an indicator (absence) of learner focus. These responses might include "a self-introduction, expression of feeling (e.g., 'I'm feeling great…'), greeting, (e.g., 'Hi everyone'), closure (e.g., 'That's it for now'), jokes, the use of symbolic icons (e.g., ☺), and compliments to others" (Angeli et al., 1998, pp. 10-11). For the purposes of the study, see Table 2, it is simply an "off-task" response not dissimilar to equivalent student chatter in a face-to-face class and often precursory to more focussed interaction.

A subliminal message [SM] is one where students "hedge around" a topic or do not make an explicit connection to the topic being discussed. The term *subliminal* was chosen to identify the fact that there are sometimes hidden messages within the response.

The messages in the forum transcripts could represent any one of the seven categories in the customised schema or combination of them. For example, where an opinion [O], a statement with personal experience [SPE] and evidence [Ev] was identified, the multiple codes of O, SPE, Ev was applied. Similarly, as the latter three elements are argument forms, they are frequently combined with the four former cognitive elements.

Discussion & Conclusion

The two schemas used in the analysis of the forums in this study offered three measurements of the use of authoritative sources. These are:
1. *Expert Opinion* – social argumentation schema (Duschl et al., 1996); and,
2. *Statement supported with personal experience* [SPE] and *Evidence not including personal experience* [Ev] from the customised schema developed for this study (see Table 2).

There is little difference between *expert opinion* and *evidence* with the latter offering slightly broader criteria for the definition of sources. Table 3 presents the instances of these measurements across the six forums.

Table 3
Instances of elements of authoritative sources in Forums 1-6

Element		Forum [eligible messages[1]]					
		1 [14]	2 [30]	3 [19]	4 [21]	5 [23]	6 [23]
Expert Opinion	(*n*=19)	0	4	4	5	3	3
EV	(*n*=24)	0	4	4	8	5	3
SPE	(*n*=83)	10	17	17	16	14	9

Notes to Table
1. Eligible messages are those posted by students. Researcher messages were eliminated from this analysis

Table 3 shows the expected parity between the measurement of Expert Opinion and Evidence. The exceptions are in Forums 4 and 6 where the broader interpretation of evidence in the customised schema allowed more inclusion of teacher input. There were instances – counted in both measures - where students drew on evidence which they had located on their own rather than making use of the resources provided by the researcher.

The relatively high instance of SPE, that is where personal experience is counted as evidence, is of particular interest in identifying knowledge building in this study. It can be interpreted in terms of ratios as:

1. Forum 1 –with 10 instances in 14 eligible messages (ratio of 0.71:1)
2. Forum 2 – with 17 instances in 30 eligible messages (ratio of 0.57:1);
3. Forum 3 – with 17 instances in 19 eligible messages (ratio of 0.89:1);
4. Forum 4 – with 16 instances in 21 eligible messages (ratio of 0.76:1);
5. Forum 5 – with 14 instances in 23 eligible messages (ratio of 0.61:1);
6. Forum 6 – with 9 instances in 23 eligible messages (ratio of 0.39:1).

In summary, it would appear that there was limited instance of evidence in terms of external reference in the forums in this study. This is consonant with findings in previous studies (see, for example, Angeli et al., 1998). This is somewhat surprising, however, given the emphasis placed on evidence by the researcher and teacher in the off-line scaffolding provided in this study.

The heightened incidence of personal evidence is not unexpected in a population of adolescents and also in a discussion of families where lived experience, by definition, will be "personal." Other explanations for this may be:

1. this incidence of heightened SPE could be an indicator of knowledge building in the sense that personalised knowledge is deep rather than surface level; and,
2. the habituated practices of schooling may also have provided a scaffold, rather than a barrier, in this instance. The relative ease with which students shared their own experiences may be a characteristic of the blended learning environment in which all participants knew each other and felt secure. The presence of their teacher and the trust given to the researcher may have also been a factor in this.

There are limitations to this study based on a small student sample of all females who can only access the discussion forum during school hours, however, the study does identify an adapted framework for argumentation that can be applied to this particular study. Argumentation was identified in the discussion forums through the use of the customised argumentation schema. However, further research, that identifies knowledge building through argument, in a teaching and learning environment that uses collaborative tools, outside of the domain of science, is needed. The adapted argumentation schema (based on the work of Duschl et al., 1999) is presented here as a model that has the potential to be used across other domains of study.

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